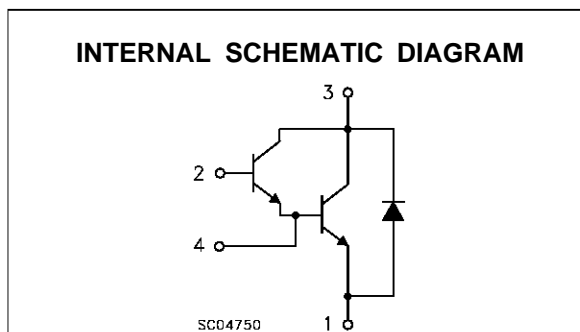
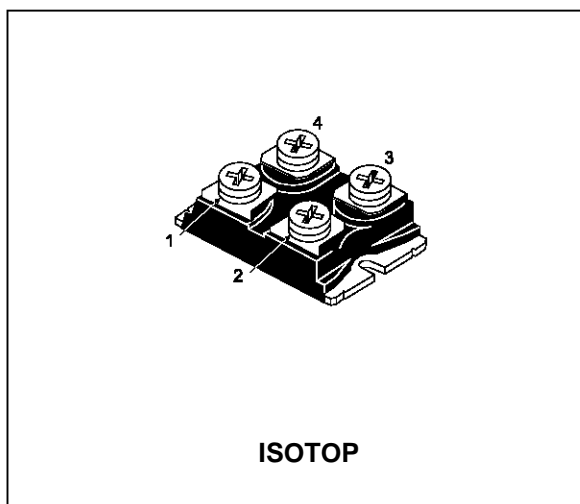


NPN DARLINGTON POWER MODULE

- HIGH CURRENT POWER BIPOLAR MODULE
- VERY LOW R_{th} JUNCTION CASE
- SPECIFIED ACCIDENTAL OVERLOAD AREAS
- ULTRAFAST FREEWHEELING DIODE
- ISOLATED CASE (2500V RMS)
- EASY TO MOUNT
- LOW INTERNAL PARASITIC INDUCTANCE

INDUSTRIAL APPLICATIONS:

- MOTOR CONTROL
- SMPS & UPS
- DC/DC & DC/AC CONVERTERS
- WELDING EQUIPMENT



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|----------------|--|------------|------|
| V_{CEV} | Collector-Emitter Voltage ($V_{BE} = -5$ V) | 600 | V |
| $V_{CEO(sus)}$ | Collector-Emitter Voltage ($I_B = 0$) | 450 | V |
| V_{EBO} | Emitter-Base Voltage ($I_C = 0$) | 7 | V |
| I_C | Collector Current | 84 | A |
| I_{CM} | Collector Peak Current ($t_p = 10$ ms) | 126 | A |
| I_B | Base Current | 8 | A |
| I_{BM} | Base Peak Current ($t_p = 10$ ms) | 16 | A |
| P_{tot} | Total Dissipation at $T_C = 25$ °C | 250 | W |
| T_{stg} | Storage Temperature | -55 to 150 | °C |
| T_j | Max. Operating Junction Temperature | 150 | °C |
| V_{ISO} | Insulation Withstand Voltage (AC-RMS) | 2500 | °C |

ESM6045DV

THERMAL DATA

| | | | | |
|----------------|---|-----|------|-----------------------------|
| $R_{thj-case}$ | Thermal Resistance Junction-case (transistor) | Max | 0.5 | $^{\circ}\text{C}/\text{W}$ |
| $R_{thj-case}$ | Thermal Resistance Junction-case (diode) | Max | 1.2 | $^{\circ}\text{C}/\text{W}$ |
| R_{thc-h} | Thermal Resistance Case-heatsink With Conductive Grease Applied | Max | 0.05 | $^{\circ}\text{C}/\text{W}$ |

ELECTRICAL CHARACTERISTICS ($T_{case} = 25^{\circ}\text{C}$ unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------------|--|--|------|---------------------------|-----------|--|
| I_{CER} # | Collector Cut-off Current ($R_{BE} = 5\ \Omega$) | $V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV}$ $T_j = 100^{\circ}\text{C}$ | | | 1.5 22 | mA mA |
| I_{CEV} # | Collector Cut-off Current ($V_{BE} = -5$) | $V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV}$ $T_j = 100^{\circ}\text{C}$ | | | 1 15 | mA mA |
| I_{EBO} # | Emitter Cut-off Current ($I_C = 0$) | $V_{EB} = 5\ \text{V}$ | | | 1 | mA |
| $V_{CEO(SUS)}$ * | Collector-Emitter Sustaining Voltage | $I_C = 0.2\ \text{A}$ $L = 25\ \text{mH}$ $V_{clamp} = 450\ \text{V}$ | 450 | | | V |
| h_{FE} * | DC Current Gain | $I_C = 70\ \text{A}$ $V_{CE} = 5\ \text{V}$ | | 120 | | |
| $V_{CE(sat)}$ * | Collector-Emitter Saturation Voltage | $I_C = 50\ \text{A}$ $I_B = 1\ \text{A}$ $I_C = 50\ \text{A}$ $I_B = 1\ \text{A}$ $T_j = 100^{\circ}\text{C}$ $I_C = 70\ \text{A}$ $I_B = 4\ \text{A}$ $I_C = 70\ \text{A}$ $I_B = 4\ \text{A}$ $T_j = 100^{\circ}\text{C}$ | | 1.2 1.6 1.35 1.7 | 2 2 | V V V V |
| $V_{BE(sat)}$ * | Base-Emitter Saturation Voltage | $I_C = 70\ \text{A}$ $I_B = 4\ \text{A}$ $I_C = 70\ \text{A}$ $I_B = 4\ \text{A}$ $T_j = 100^{\circ}\text{C}$ | | 2.3 2.4 | 3 | V V |
| di/dt | Rate of Rise of On-state Collector | $V_{CC} = 300\ \text{V}$ $R_C = 0$ $t_p = 3\ \mu\text{s}$ $I_{B1} = 1.5\ \text{A}$ $T_j = 100^{\circ}\text{C}$ | 375 | 450 | | $\text{A}/\mu\text{s}$ |
| $V_{CE(3\ \mu\text{s})}$ • | Collector-Emitter Dynamic Voltage | $V_{CC} = 300\ \text{V}$ $R_C = 6\ \Omega$ $I_{B1} = 1.5\ \text{A}$ $T_j = 100^{\circ}\text{C}$ | | 6 | 9 | V |
| $V_{CE(5\ \mu\text{s})}$ • | Collector-Emitter Dynamic Voltage | $V_{CC} = 300\ \text{V}$ $R_C = 6\ \Omega$ $I_{B1} = 1.5\ \text{A}$ $T_j = 100^{\circ}\text{C}$ | | 3 | 4.5 | V |
| t_s | Storage Time | $I_C = 50\ \text{A}$ $V_{CC} = 50\ \text{V}$ | | 3.5 | 5.5 | μs |
| t_f | Fall Time | $V_{BB} = -5\ \text{V}$ $R_{BB} = 0.3\ \Omega$ | | 0.3 | 0.5 | μs |
| t_c | Cross-over Time | $V_{clamp} = 450\ \text{V}$ $I_{B1} = 1\ \text{A}$ $L = 0.05\ \text{mH}$ $T_j = 100^{\circ}\text{C}$ | | 0.8 | 1.7 | μs |
| V_{CEW} | Maximum Collector Emitter Voltage Without Snubber | $I_{C\text{Woff}} = 84\ \text{A}$ $I_{B1} = 4\ \text{A}$ $V_{BB} = -5\ \text{V}$ $V_{CC} = 50\ \text{V}$ $L = 0.03\ \text{mH}$ $R_{BB} = 0.3\ \Omega$ $T_j = 125^{\circ}\text{C}$ | 450 | | | V |
| V_F * | Diode Forward Voltage | $I_F = 70\ \text{A}$ $T_j = 100^{\circ}\text{C}$ | | 1.6 | 1.9 | V |
| I_{RM} | Reverse Recovery Current | $V_{CC} = 200\ \text{V}$ $I_F = 70\ \text{A}$ $di_F/dt = -375\ \text{A}/\mu\text{s}$ $L < 0.05\ \mu\text{H}$ $T_j = 100^{\circ}\text{C}$ | | 38 | 45 | A |

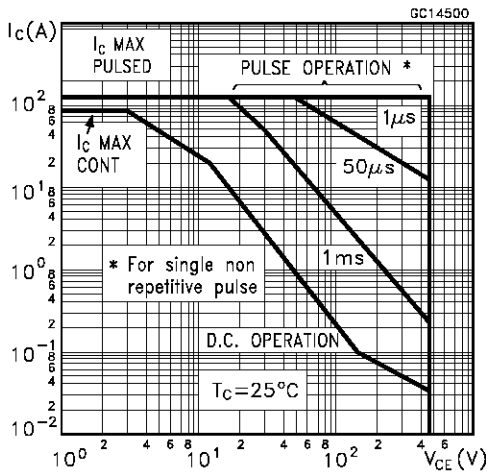
* Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

See test circuits in databook introduction

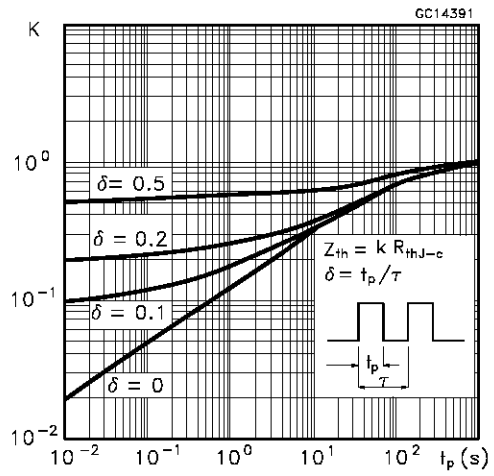
To evaluate the conduction losses of the diode use the following equations:

$$V_F = 1.5 + 0.0055 I_F \quad P = 1.5 I_{F(AV)} + 0.0055 I_{F(RMS)}^2$$

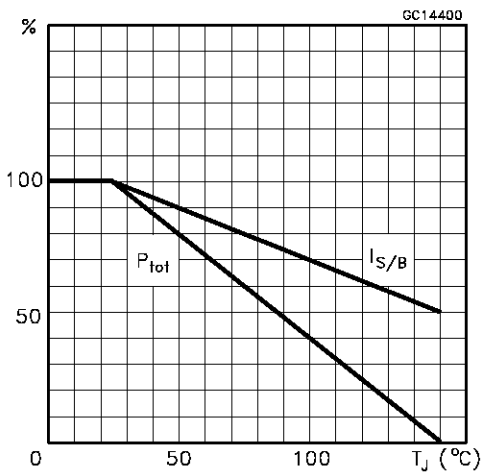
Safe Operating Areas



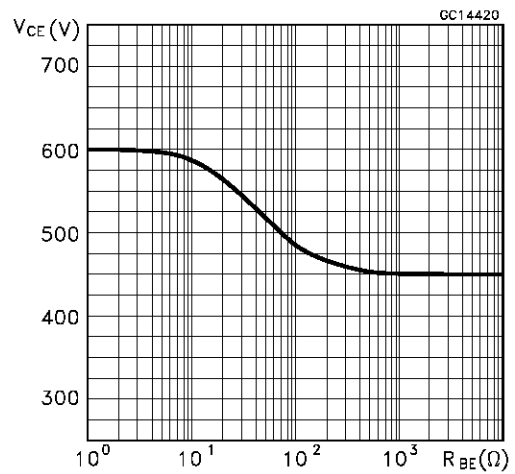
Thermal Impedance



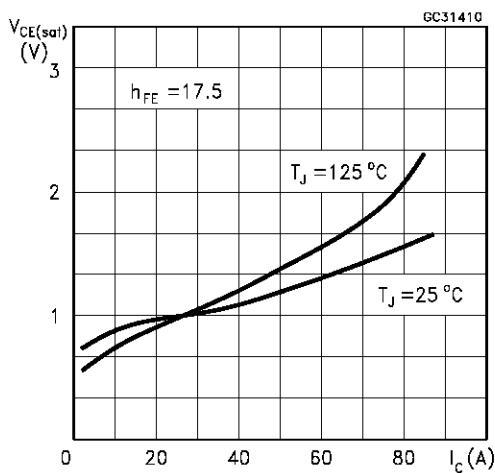
Derating Curve



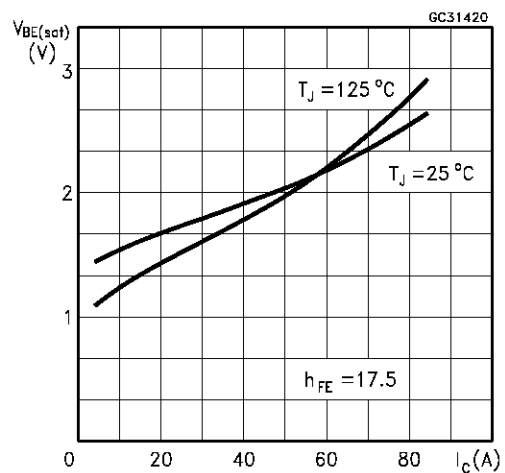
Collector-emitter Voltage Versus base-emitter Resistance



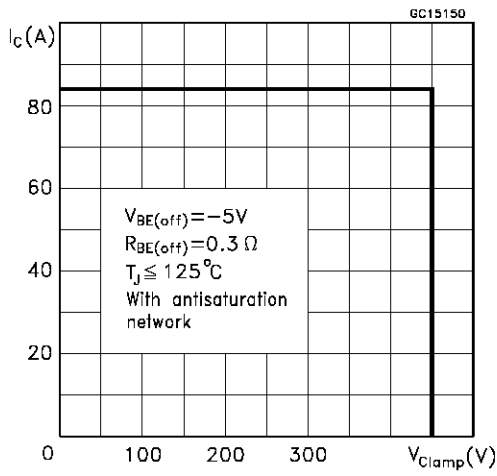
Collector Emitter Saturation Voltage



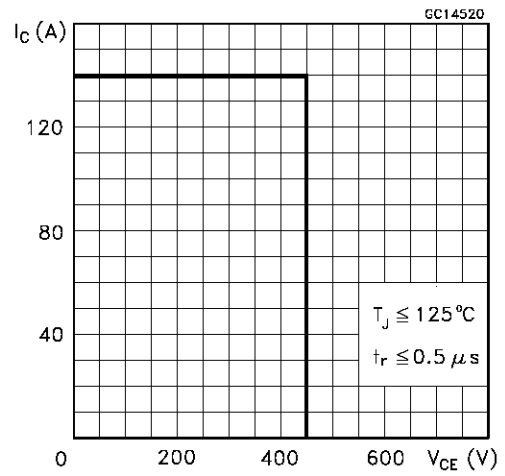
Base-Emitter Saturation Voltage



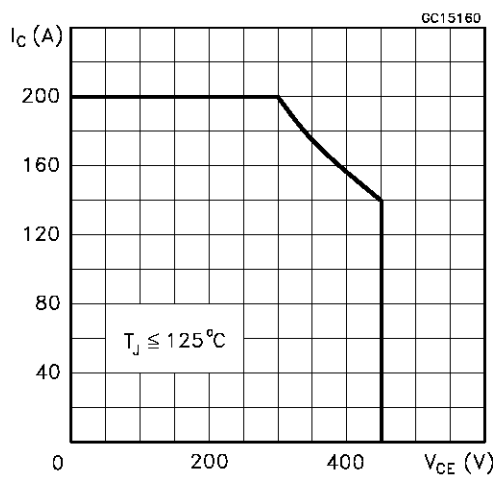
Reverse Biased SOA



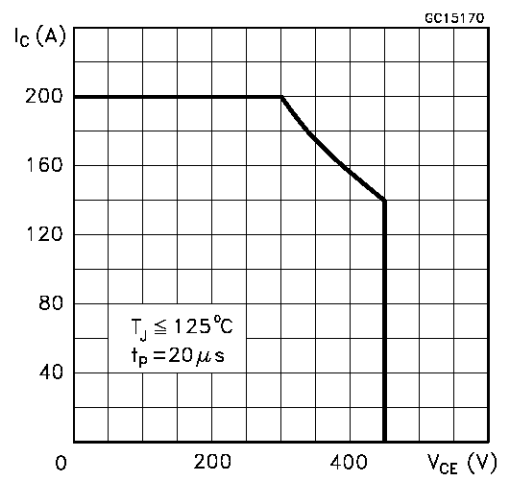
Forward Biased SOA



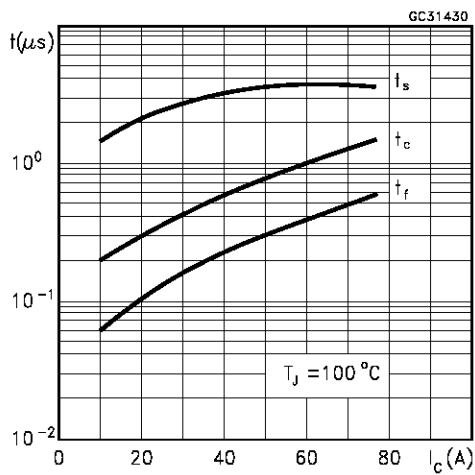
Reverse Biased AOA



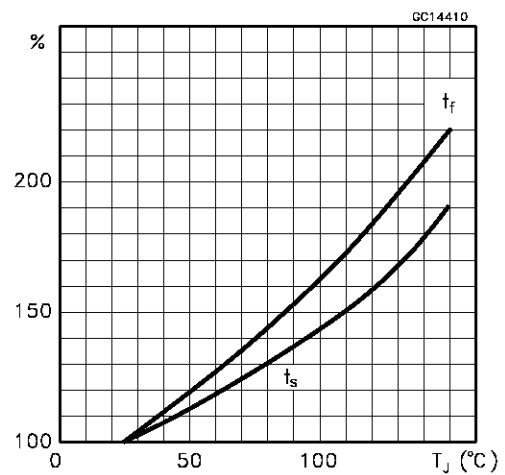
Forward Biased AOA



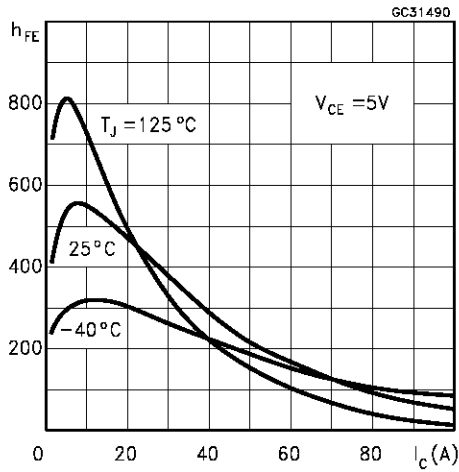
Switching Times Inductive Load



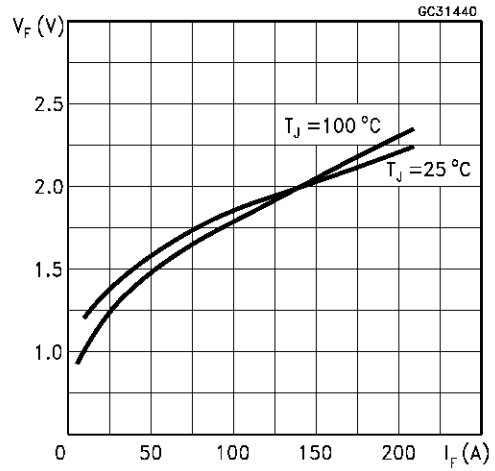
Switching Times Inductive Load Versus Temperature



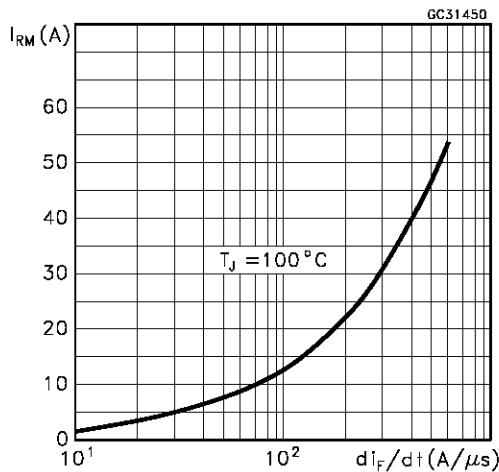
Dc Current Gain



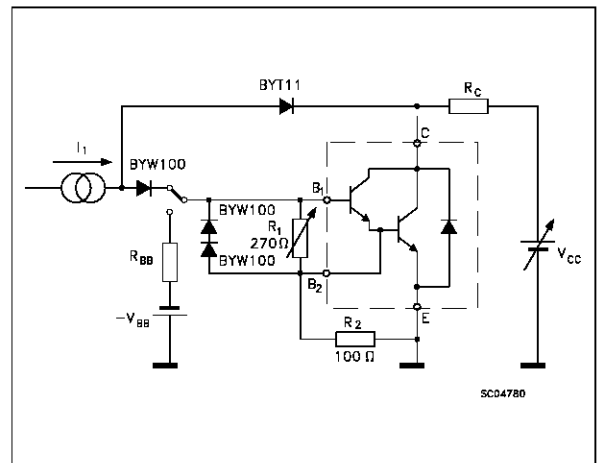
Typical VF Versus IF



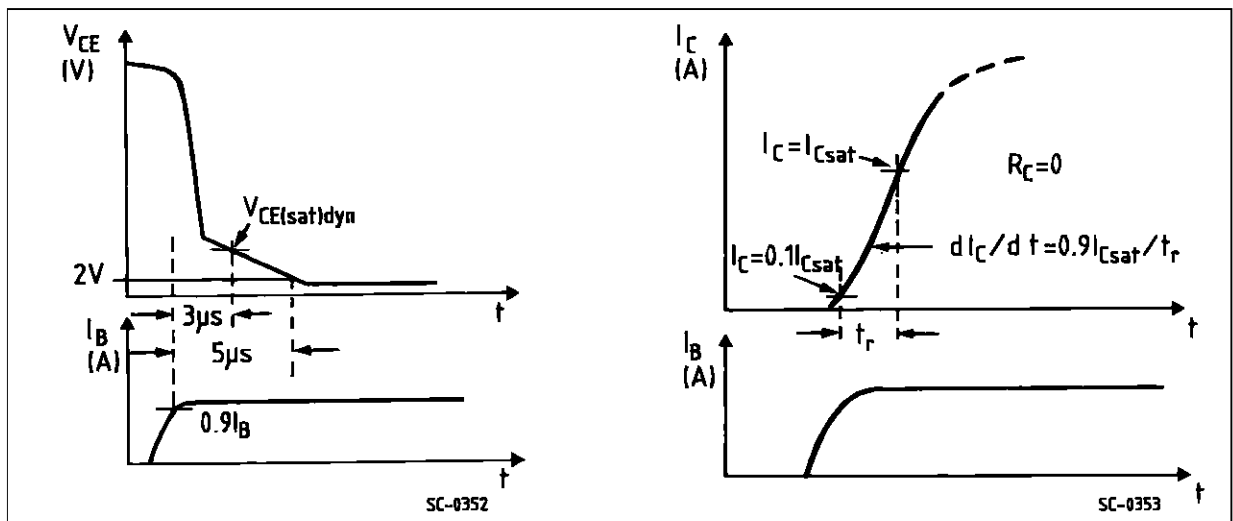
Peak Reverse Current Versus diF/dt



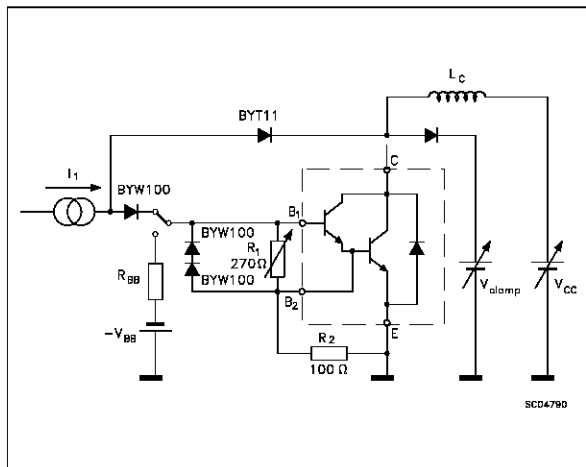
Turn-on Switching Test Circuit



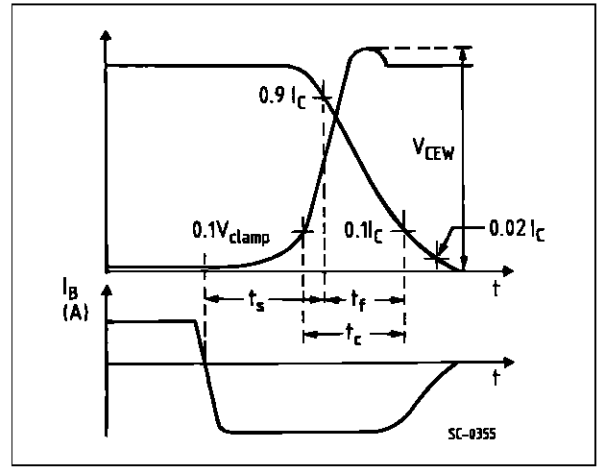
Turn-on Switching Waveforms



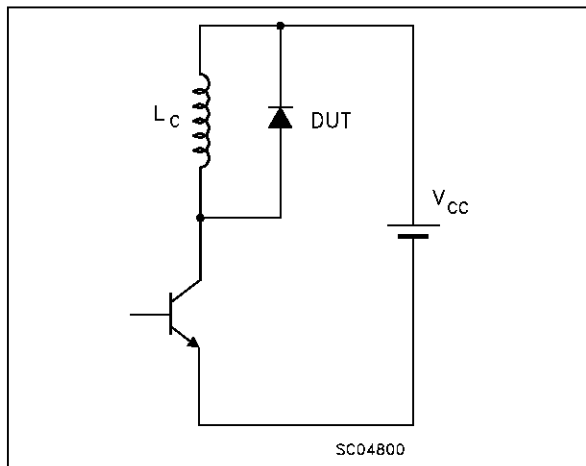
Turn-on Switching Test Circuit



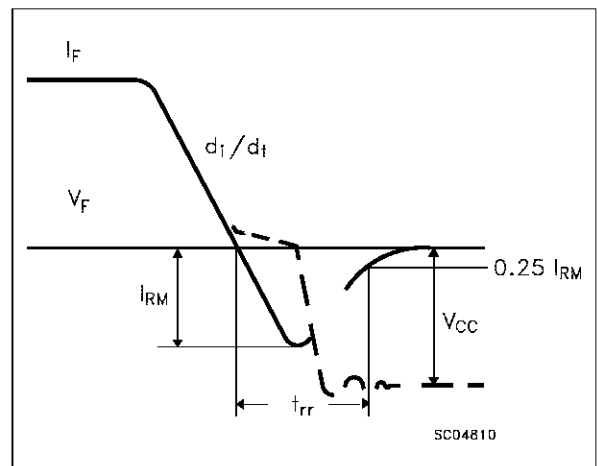
Turn-off Switching Waveforms



Turn-off Switching Test Circuit of Diode

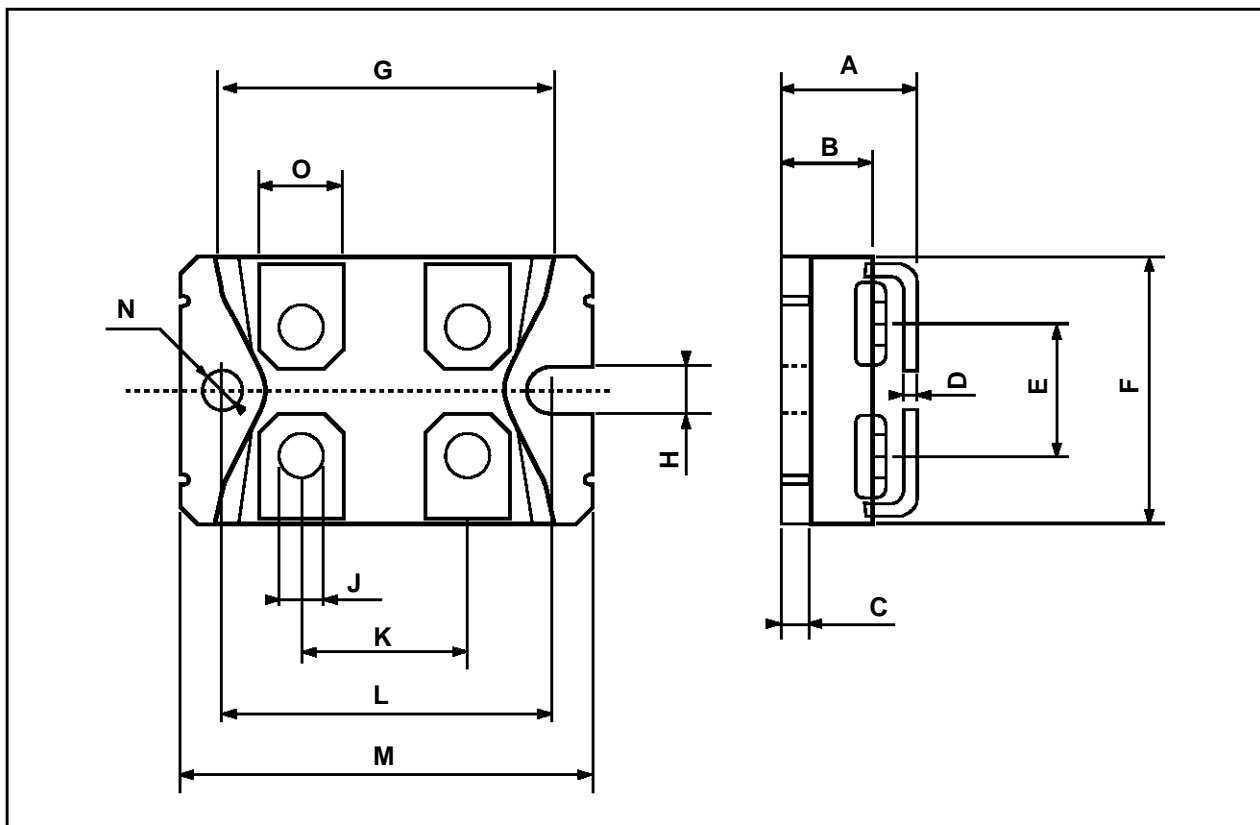


Turn-off Switching Waveform of Diode



ISOTOP MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|------|-------|------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 11.8 | | 12.2 | 0.466 | | 0.480 |
| B | 8.9 | | 9.1 | 0.350 | | 0.358 |
| C | 1.95 | | 2.05 | 0.076 | | 0.080 |
| D | 0.75 | | 0.85 | 0.029 | | 0.033 |
| E | 12.6 | | 12.8 | 0.496 | | 0.503 |
| F | 25.15 | | 25.5 | 0.990 | | 1.003 |
| G | 31.5 | | 31.7 | 1.240 | | 1.248 |
| H | 4 | | | 0.157 | | |
| J | 4.1 | | 4.3 | 0.161 | | 0.169 |
| K | 14.9 | | 15.1 | 0.586 | | 0.594 |
| L | 30.1 | | 30.3 | 1.185 | | 1.193 |
| M | 37.8 | | 38.2 | 1.488 | | 1.503 |
| N | 4 | | | 0.157 | | |
| O | 7.8 | | 8.2 | 0.307 | | 0.322 |



Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectronics.

© 1997 SGS-THOMSON Microelectronics - Printed in Italy - All Rights Reserved

SGS-THOMSON Microelectronics GROUP OF COMPANIES
Australia - Brazil - Canada - China - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands -
Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A
...